Investigating Mercury Contamination in Lake Victoria

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[Photo: Linda Campbell in Butiaba near Lake Albert.]

Mercury contamination may pose a threat to African children, pregnant women, and other 'high-risk' groups who eat Nile perch from Lake Victoria — the world's largest freshwater fishery.

Studies by Linda Campbell, a Ph.D student at the University of Waterloo in Ontario, have shown that levels of organic mercury found in Nile tilapia and mukene — the most popular Lake Victoria fish species — are generally benign. However, she has found potentially harmful concentrations of the neurotoxic heavy metal in large Nile perch, a predator fish that sits at the top of the lake's food chain.

Doctoral Research Award

Campbell, the recipient of a Doctoral Research Award from the International Development Research Centre (IDRC), is currently investigating the sources of mercury in Lake Victoria; how it cycles between air, water, lake sediments, and aquatic life; and whether or not the risk from mercury contamination is increasing.

Her thesis supervisor, Robert Hecky, the United Nations University Chair in African Lakes and Rivers at the University of Waterloo, has documented how flooding can lead to elevated mercury levels in the Canadian environment. Campbell was introduced to Dr Hecky at the Freshwater Institute in Manitoba, while doing lab work for her Master's research on organochlorine contaminants in a Rocky Mountain lake. "I was interested in the opportunity to expand my contaminant experience and study contaminants in a warm water tropical lake," she explains.

Lake under threat

Lake Victoria is the second largest lake in the world and the largest tropical lake. Bordered by Tanzania, Uganda, and Kenya, it provides a livelihood for millions of Africans in the region. However, the lake is under threat from eutrophication (a process in which excess nutrients enter the water, resulting in algal blooms), a huge decline in the number of native fish species caused by the introduction of Nile perch, invasion by water hyacinth plants, overfishing, and pollution.

According to Campbell, Lake Victoria fish contain lower levels of mercury than some other lakes in the region, such as Lake Malawi and Lake Albert. Her research suggests that most fish species caught in Lake Victoria are safe to eat, even if consumed often, with the risk of ingesting mercury outweighed by the benefits of including cheap fish protein in local diets. This is good news for fish exporters, who must meet international guidelines for 'acceptable' mercury levels.

Mercury levels

However, her data indicate that mercury concentrations in large Nile perch, weighing more than 5-10 kilograms (kg), usually exceed 200 nanograms per gram (ng/g) in fish tissue. This limit was set by the World Health Organization to protect frequent fish eaters, children under age 15, and the developing fetus. Mercury poisoning has particularly serious implications for young people because it can impair neurological development, and cause mental and physical disability.

Previous studies involving Tanzanian fishers, goldfield workers, and local residents revealed that some East African have high levels of mercury in their hair. Moreover, there were signs of possible mercury poisoning in certain individuals, although "it could not be related to the total amount of mercury found in their hair," states Campbell. "These studies examined adults who consented to have their hair sampled, not children," she adds.

Overfishing

Although Campbell has yet to determine whether mercury levels are increasing in Lake Victoria, she notes that overfishing — while detrimental to the long-term sustainability of the fishery — may have a beneficial side effect. Likely due to overfishing, "Nile perch have been getting smaller and taking up less of the total volume of fishermen's catches over the past few years. They can grow up to 100 kg in some regions, and my data shows that Nile perch over 5-10 kg in Lake Victoria consistently contain enough mercury to put frequent consumers at risk. But in most catches, the largest Nile perch may only reach 4 or 5 kg," she explains.

After spending the summer gathering field data around Lake Victoria, Campbell is back in Canada doing laboratory analyses. "The most challenging aspect of my research was learning the ins and outs of research in East Africa," she says. "I have been fortunate to have the strong support of the Fisheries Resources Research Institute (the Director, Dr Richard Ogutu-Ohwayo, is a former IDRC award winner) and the European Union-sponsored Lake Victoria Fisheries Research Project, both based in Jinja. While culture shock was inevitable, especially in more remote areas, it was good to be able to discuss do's and don'ts with local people freely."

Communication challenge

"My other major challenge was learning all the different accents in East Africa, in order to be able to lipread each person," adds Campbell, who is deaf. "Communication is always a challenge, but I've found it easier at times in East Africa than in Canada to exchange ideas and concepts. It may be that they are used to dealing with different languages and cultures, and can read body language very well. They seemed more willing to try different ways of communicating — like writing and gesturing — if the spoken word didn't work out."

John Eberlee is the Managing Editor of IDRC Reports Online. (Photo: L. Campbell)

If you have any comments about this article, please contact info@idrc.ca .

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